TM 11-5825-231-24R-725

TECHNICAL MANUAL

ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT

MAINTENANCE MANUAL

RADIO RECEIVER R-725/URR
EXTRACT

SC
3585
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This copy is a reprint which includes current pages from Changes 1 through 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
AUGUST 1973

WARNING

RADIATION HAZARD

Co	60
Ni	63
Ra	226

Tube types OB2WA used in this equipment contains radioactive material. These tubes are potentially hazardous when broken; see qualified medical personnel and the Safety Director if you are exposed to or cut by broken tubes.

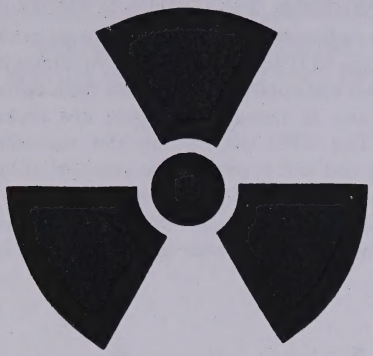
Never place radioactive tubes in your pocket.

Use extreme care not to break radioactive tubes while handling them.

Never remove radioactive tubes from cartons until ready to use them.

Refer to TM 11–5825–231–10 on handling, storage, and disposal of radioactive material.

WARNING
RADIATION HAZARD



RADIOACTIVE MATERIAL
CONTROLLED DISPOSAL REQUIRED
ACCOUNTABILITY NOT REQUIRED

STD RW—2

Audio level meter	Ra 226	0.69uCi	6625-00-669-0769
Electron Tube	OB2WA		
EEVC	U 238	0.1uCi	
Raytheon	Co 60	0.2uCi	
Electron Tube	OB2WA		5960-00-624-4718
Chatham Electronics	Ra 226	0.005uCi	
Electron Tube	OA2WA		5960-00-503-4880
EEVC	U 238	0.1uCi	
CBS Hytron	Ni 63	0.5uCi	
Raytheon	Co 60	0.2uCi	
Electron Tube	5651WA		5960-00-262-0286
	Ra 226	0.005uCi	

Radiation Hazard Information: The following radiation hazard information must be read and understood by all personnel before operating or repairing Direction Finder Sets AN/TRD-23, AN/TRD-23A, AN/TRD-15 and AN/TRD-15A. Hazardous radioactive materials are present in the above listed components of the IP-669, PP-4482/TRD, R-776/URR, R-725, and R-1098/TRR-15.

The components are potentially hazardous when broken. See qualified medical personnel and the local Radiological Protection Officer (RPO) immediately, if you are exposed to or cut by broken components. First aid instructions are contained in TB 43-0116, TB 43-0122, and AR 755-15.

NEVER place radioactive components in your pocket.

Use extreme care NOT to break radioactive components while handling them.

NEVER remove radioactive components from cartons until you are ready to use them. If any of these components are broken, notify the local RPO immediately. The RPO will survey the immediate area for radiological contamination and will supervise the removal of broken components.

The above listed radioactive components *will not* be repaired or disassembled. Disposal of broken, unserviceable, or unwanted radioactive components will be accomplished in accordance with the instructions in AR 755-15.

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TECHNICAL MANUAL
No. 11-5825-231-24

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *31 August 1973*

ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT, MAINTENANCE MANUAL RADIO RECEIVER R-725/URR

		Paragraph	Page
CHAPTER 1.	INTRODUCTION	1-1 — 1-4	1-1
2.	FUNCTION		
Section I.	System Functioning		2-1
II.	Unit Functioning	2-8	2-14
CHAPTER 3.	ORGANIZATIONAL MAINTENANCE INSTRUCTIONS		
Section I.	General	3-1, 3-2	3-1
II.	Preventive maintenance	3-3 — 3-6	3-1
III.	Organizational Troubleshooting procedures	3-7 — 3-8	3-3
CHAPTER 4.	DS AND GS MAINTENANCE AND FINAL TESTING AN/TRD-23(A)		
Section I.	General	4-1 — 4-3	4-1
II.	DS and GS troubleshooting procedures	4-4, 4-8	4-3
IV.	Adustment and alignment	4-22, 4-26	4-52
CHAPTER 6.	SHIPMENT, LIMITED STORAGE, AND DEMOLITION	6-1, 6-2	6-1
CHAPTER 7.	FINAL TESTING PROCEDURES		
Section I.	General	7-1, 7-2	7-1
II.	Test procedures	7-6	7-5
APPENDIX A.	REFERENCES		A-1
INDEX			Index 1

*This manual supersedes TM 11-5825-231-25, 25 May 1966.

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3585
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LIST OF ILLUSTRATIONS

No.	Title	Page
2–11.	If amplifier, block diagram	2–16
4–13.	If subchassis, top view, Location of components, tubes, transformers, and controls	4–16
4–14.	If subchassis, bottom view, Location of components, capacitors	4–17
4–15.	If subchassis, Location of components, resistors	4–18
4–49.	If subchassis, alignment chart	4–57
4–50.	Radio Receiver R–725/URR, test setup, alignment	4–58
4–51.	Radio Receiver R–725/URR, gain test setup	4–60
6–5.	R–390A/URR receiver modification	6–5
6–10.	If subchassis, vr measurements	6–10
7–8.	Adapter, 50 to 125 ohms	7–8
7–9.	Test setup, if phase shift	7–8
7–10.	Test setup, agc and sensitivity	7–9
7–11.	Test setup, gain and if	7–9
7–12.	Test setup, selectivity	7–10
FO–4.	If subchassis, schematic diagram	Fold-in

CHAPTER 1
INTRODUCTION

1-1. Scope

This manual described Direction Finder Sets AN/TRD-23, AN/TRD-23A (chap. 1 through 4), AN/TRD-15, and AN/TRD-15A (chap. 5) covering their functioning and organizational, direct support (DS), general support (GS), and field testing. It includes instructions for troubleshooting, testing, aligning, and repairing all units of the system which are not covered by other manuals. Operating instructions are contained in TM 11-5825-231-10.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Reporting of Errors

The reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

1-3.1 Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenace personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A, and DLAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

1-3.2. Reporting Equipment Improvement Recommendations (EIR)

EIR's will be prepared using SF 368 (Quality Deficiency Report). Instructions for preparing EIR's are provided in TM 38-750, the Army Maintenance Management System. EIR's should be mailed direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

1-4. Items Not Covered

b. The maintenance of Receiver, Radio R-390A/URR is covered in TM 11-5820-358-35.

NOTE

Radio Receiver R-725/URR is a modified Receiver, Radio R-390A/URR.

CHAPTER 2
FUNCTION

Section I. SYSTEM FUNCTIONING

Section II. UNIT FUNCTION

2-8. Receiver, Radio R-725/URR

a. General.

(1) For a detailed discussion and circuit analysis of the R-725/URR, refer to TM 11-5820-358-35 which covers Receiver, Radio R-390A/URR. The information is unchanged except as listed below.

(*a*) A hum-bucking circuit has been added to the R-390A/URR as shown in figure 6-5 to improve performance. This modification places a positive dc voltage on the filament of the variable frequency oscillator (vfo) (V701) in the receiver, reducing the heater-to-cathode leakage of 60 Hz into the signal.

(*b*) The if. amplifier subchassis has been replaced in its entirety. Refer to *b* and *c* below for detailed discussion of this chassis.

(2) The receiver provides continuous-wave (cw), modulated continuous wave (mcw), and am. reception over a frequency range from 0.54 to 32 MHz. The receiver is basically a superheterodyne of the multiple conversion type. Triple-conversion is used for lower frequencies (0.5 to 8 MHz). The receiver normally operates from a self-contained power supply designed to operate at a nominal input of 115 or 230 volts over a frequency range from 48 to 62 Hz. However, provision is made to use a dynamotor in

place of the ac power supply for dc operation.

(3) The tuning system of the R-725/URR provides linear tuning over the entire frequency range of the receiver. Permeability tuning (insertion of powered-iron cores into coils) and a system of gears and cams make linear tuning possible and permit the use of a counter-type indicator on the front panel to show the frequency selected.

(4) The receiver power supply provides dc for the antenna and break-in relays, ac to the filament and oven circuits, and B+ voltage to the voltage regulator circuit. All B+ voltages supplied to the receiver are regulated. The voltage regulator circuit consists of a series regulator, a dc amplifier, and voltage reference tubes. The power supply consists of a transformer and two rectifiers The transformer has two primary windings which are connected in series for 230-volt operation, and in parallel for 115-volt operation.

b. If. Strip Block Diagram (fig. 2–11).

(1) The if. subchassis contains six voltage amplifier stages, a detector, automatic gain contro (agc), beat frequency oscillator (bfo), limiter, and cathode-follower output stages.

(2) A 455-kHz signal from the third mixer of the main receiver is amplified by the first five stages of the if. amplifier. The output of the fifth stage goes to the agc circuit, the sixth if. amplifier, and the cathode-follower output stage, which supplies the 455-kHz signal to the rf detector.

(3) The output of the sixth if. stage is mixed with the output of the bfo, detected, and passed through a limiter to the audio amplifier on the main chassis.

c. If. Strip, Stage Analysis (fig. FO–4).

(1) The 455-kHz signal from the third mixer in the main receiver enter the if. chassis at J518. The signal is then routed to the first if. amplifier through cyrstal filter Z501. For the two narrow pass bands, 0.1 and 1 kHz, the crystal filter is used. Four additional degrees of selectivity which do not use the crystal filter are accomplished in the if. stages by the BANDWIDTH KC switch which varies the coupling between the primary and secondary circuits of the if. transformers. The if. amplifier consists of six stages, V501 through V506 which, together with the associated transformers, provide the required pass band.

(2) The output of fifth if. amplifier V505 is divided to supply a 455-kHz signal to each of three stages: sixth if. amplifier V506, agc amplifier V509, and the cathode follower, one-half of V511. The output signal of the sixth if. amplifier is demodulated in the detector circuit, one-half of V507. An external load may be connected from DIODE LOAD (terminal 14) to ground, with the jumper between terminals 14 and 15 removed. The output of the fifth if. amplifier is amplified in agc amplifier V509, and the resulting signal is rectified by the agc rectifier, one-half of V510. When the FUNCTION switch is set for AGC operation, the gain of rf amplifier V201 and if. amplifiers V501 and V505 is controlled automatically by a dc voltage developed by the agc rectifier, one-half of V510, to keep the output level of the receiver relatively constant and independent of signal strength variation at the antenna. Thus for strong signals, the grid bias is high and the gain of the controlled stages is reduced. The reverse action occurs for weak signals. The response rate of the agc circuits can be controlled to satisfy reception requirements through the use of the AGC switch, the agc time constant circuit, and one-half of tube V511. For MGC operation, the agc bus is grounded by the FUNCTION switch. The cathode follower, one-half of V511, provides a low-impedance connection (50 ohms) from the output of the fifth if. stage, through J514 to the rf detector.

(3) To facilitate operation in the reception of radiotelegraph signals, in certain system applications and in calibration, bfo tube V508 provides a signal in the frequency range from 452 to 458 kHz. This signal is mixed with the 455-kHz if. output signal of the sixth if. amplifier to produce a beat frequency in the output of the detector which is in the audiofrequency (af) range.

(4) The output of the detector (one-half of V507) is coupled to the af amplifier (V602A) through a negative peak limiter (one-half of V507) and a positive peak limiter (one half of V510) which prevents noise peaks from exceeding average signal level. If operation without limiting is desired, the limiters can be disabled by a front panel control.

(5) In addition to supplying signals to the limiter, the detector (one-half of V507) supplies a dc signal to the squelch tube, V606, which is a voltage amplifier. The average dc output voltage of the squelch tube varies in proportion to the average signal level. When the signal level drops below some predetermined noise level established by the setting of the RF GAIN control, and when the FUNCTION switch is set for SQUELCH operation, this voltage operates squelch relay K602. Squelch relay K602 short circuits the output of af amplifier V602B to quiet the receiver output.

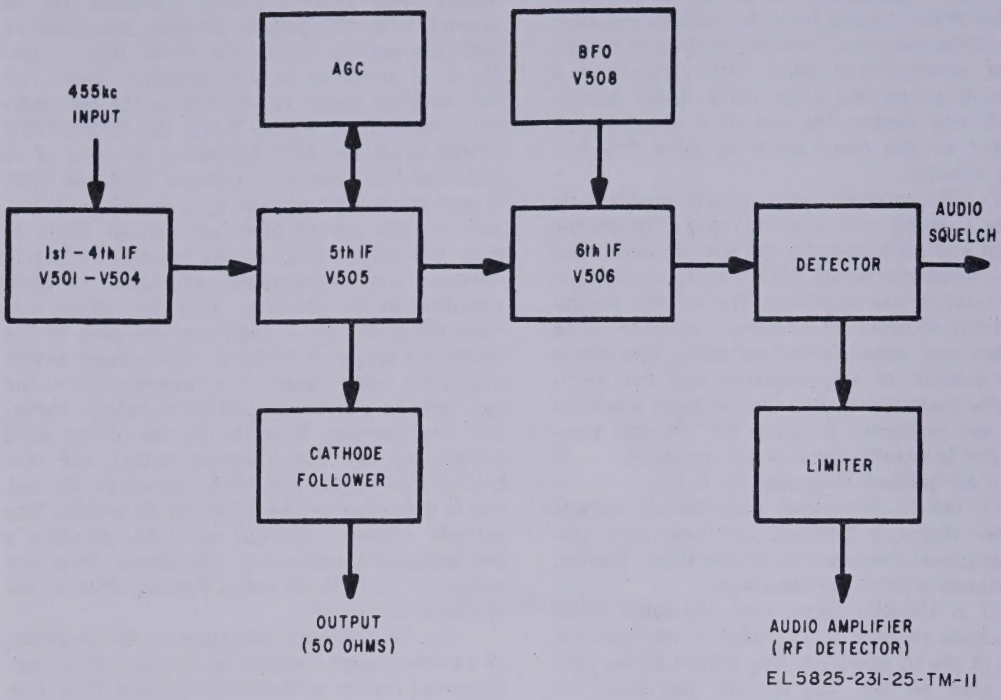


Figure 2–11. If. amplifier, block diagram.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. GENERAL

3-1. Scope of Organizational Maintenance

a. This chapter contains instructions covering organizational maintenance for Direction Finder Sets AN/TRD-23(*). It includes instructions for performing preventive and periodic maintenance, and troubleshooting functions to be performed by the organizational repairman.

b. Organizational maintenance of the direction finder set includes:

(1) Preventive maintenance (para 3-3 through 3-6).

(2) Troubleshooting (para 3-7 through 3-9).

(3) Repair and adjustment (para 3-10).

3-2. Tools and Test Equipment

The tools and test equipment required to perform organizational maintenance on the AN/TRD-23(*) are:

Federal stock No.	*Equipment*	*References*
6625-376-4939	Test Set, Electron Tube TV-7A/U	TM 11-6625-274-12
5180-856-1578	Tool Kit, Radio Repairman TK-115/U	
6625-553-0142	Multimeter TS-352B/U	TM 11-6625-366-15
NSN	Probe, Test MX-8385/U	

Section II. PREVENTIVE MAINTENANCE

3-3. General

a. Preventive maintenance is the systematic care, inspection and servicing of equipment to assure maximum operational capability. Preventive maintenance checks and services of the AN/TRD-23(*) at organizational category are made at monthly and quarterly intervals unless otherwise directed by the commanding officer.

b. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

c. Monthly maintenance consists of the following:

(1) Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para 3-4).

(2) Adjustment of the maintenance intervals must be made to compensate for unusual operating conditions.

(3) Equipment in limited storage does not require monthly preventive maintenance.

d. Quarterly maintenance consists of the following:

(1) Perform the checks and services listed in paragraph 3-5 quarterly.

(2) Monthly maintenance services constitute a part of the quarterly maintenance and must be performed concurrently.

3-4. Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	*Item to be inspected*	*Procedure*	*References*
1	Cabinet interiors	Open rear doors of all consoles and check interiors for water leakage condensation and corrosion.	
2	Electron tubes	Check electron tubes for loose envelopes, cap connectors, cracked sockets, insufficient socket spring tension.	
3	Oil-filled capacitors (CP type with metal case).	Check for leaks, bulges, and discoloration.	

Sequence No.	Item to be inspected	Procedure	References
4	Variable capacitor	Check for dirt, moisture, misalignment of plates, and loose mountings.	Para 4-7, TM 11-5825-231-10.
5	Resistors	Check bushings and insulators for cracks, chips, blistering, discoloration, and moisture.	
6	Capacitor and resistor terminals.	Check for corrosion, dirt, and loose contacts.	Para 4-7, TM 11-5825-231-10.
7	Wafer switches	Check contacts for dirt or corrosion	Para 4-7, TM 11-5825-231-10.
8	Terminal block	Check for loose connections, cracks, and breaks.	
9	Transformers, choke, potentiometer, and rheostats.	Check connection, mounting hardware, and components for signs of overheating.	
10	Azimuth indicators	Check for burn spot on cathode-ray tubes.	
11	Receivers	Check the receivers in accordance with procedures in the maintenance manual.	TM 11-5825-358-20.
12	Target transmitter	Turn transmitter on. Check for flashing of indicator lamp.	

3-5. Quarterly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be inspected	Procedure	References
1	Completeness	See that the equipment is complete	Para 1-6, TM 11-5825-231-10.
2	Installation	See that equipment is properly installed.	Para 2-6, TM 11-5825-231-10.
3	Cleanliness	See that equipment is clean	Para 4-7, TM 11-5825-231-10.
4	Preservation	Check all surfaces for evidence of fungus. Remove rust and corrosion and spot-paint bare spots.	Para 4-7 and 5-10, TM 11-5825-231 10.
5	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310-4.
6	Modifications	Determine if new applicable MWO's have been published. ALL URGENT MWO's must be applied immediately. ALL NORMAL MWO's must be scheduled.	DA Pam 310-7.
7	Gaskets	Check gaskets for moisture, oil saturation, and brittle, brown, cracked, loose, pinched, or mismatched sections.	
8	Pluckout items	Inspect clamps and seating of pluckout items. Check for wrong, bent, or broken parts.	
9	Fuses	See that all operating fuses are of the correct value. Check spare fuses for proper value and quantity.	Para 4-10, TM 11-5825-231-10.
10	Mounting	See that all bolts, nuts, and washers are correctly positioned and properly tightened. Check for cracked, bent, or broken brackets.	
11	Connections	Check to be sure that plugs and sockets are clean, intact, and not loose-fitting.	Para 4-7, TM 11-5825-231-10.
12	Knobs, dials, and switches	While making the operating checks, observe that the mechanical action of each knob, dial, and	

Sequence No.	Item to be inspected	Procedure	References
		switch is smooth and free of external or internal binding.	
13	Receivers	Check the receivers in accordance with the preventive maintenance checks and services chart.	TM 11-5825-358-20.

3-6. Lubrication

No periodic lubrication is required for Direction Finder Set AN/TRD-23(*). All required lubrication has been performed at the factory and is sufficient for the life of the equipment.

Section III. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES

3-7. Scope of Troubleshooting

a. The troubleshooting and repair work which can be performed at organizational maintenance is necessarily limited in scope by the tools, test equipment, and replaceable parts available. Accordingly, the procedures in this section require only equipment which has been listed in paragraph 3-2.

b. The troubleshooting procedures which follow provide for isolation of a malfunction to a unit and of corrective measures to be taken. If the corrective measures described do not correct the malfunction, the defective unit should be replaced and returned to a repair facility.

3-8. Visual Inspection

a. General. Failures in electronic equipment may often be caused by one or more of the following items.

(1) Improperly connected, disconnected, or broken cables.

(2) All pilot lamps on. Replace defective lamps.

(3) All units receiving power. Check tubes or pilot lamps.

CHAPTER 4

DS AND GS MAINTENANCE AND FINAL TESTING FOR AN/TRD-23(*)

Section I. GENERAL

4-1. Scope of Maintenance Instructions (AN/TRD-23(*))

The maintenance procedures in this chapter supplement the procedures in the organizational maintenance instructions (ch 3). The systematic troubleshooting procedure, which begins with the operational and sectionalization checks that can be performed at organizational category, is carried to a higher category in this chapter. Sectionalization, localizing, and isolating techniques used in the troubleshooting procedures are more advanced. Section II provides bench troubleshooting procedures; section III describes repairs and parts replacement techniques; section IV details adjustment and alignment procedures for each unit.

4-2. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective direction finder set is to sectionalize the fault. Sectionalization means tracing the fault to a major functional unit. The second step is to localize the fault. Localization means tracing the fault to a defective part responsible for the abnormal condition. Some faults, such as burned-out resistors, high-leakage capacitors, arcing and shorted transformers can often be located by sight, smell, and hearing. The majority of faults, however, must be isolated by checking voltages and resistances.

b. Sectionalization. The two tests listed below are designed to reduce unnecessary work, and to aid in tracing trouble in a defective direction finder set. The AN/TRD-23(*) consists of the following major sections or units: antenna system, antenna coupler, goniometer drive, control amplifier, receivers, rf detector, power supply, azimuth indicator, power panel, and target transmitter. The first step is to locate the section or unit at fault by the following methods:

(1) *Visual inspection tests.* The purpose of visual inspection is to locate faults without testing or measuring circuits. Meter readings, scope patterns (holes or peaks), and other visual signs should be observed in an attempt to sectionalize the fault to a particular unit.

(2) *Operational tests.* Operational tests often indicate the general location of trouble. In many cases, the tests help to determine the exact nature of the fault. The equipment operational checklist (TM 11-5825-231-10), is a good test as a start. Additional tests are given in paragraph 3-9.

c. Localization. The tests listed below will aid in isolating the trouble. First localize the trouble to a single stage or circuit, and then isolate the trouble within that circuit by voltage, resistance, and continuity measurements. Use the following methods of trouble localization:

(1) *Signal tracing.* Signal tracing in an orderly fashion through the units will help in isolating a trouble to a specific circuit at fault.

(2) *Voltage and resistance measurements.* Certain units of the direction finder set are transistorized and only the specified voltages and resistance should be measured. Do not make any other measurements. (An accidental short or the application of a voltage from the ohmmeter battery is sufficient to burn out a transistor.) Use the voltage and resistance charts and compare them with the readings observed to locate the fault.

(3) *Troubleshooting chart.* The trouble symptoms and causes listed in the troubleshooting chart will aid in localizing trouble to a component part.

(4) *Stage gain chart.* Where applicable, certain units may be checked more readily by inserting a known voltage and observing the output voltage to determine individual stage gain. Comparison can be made with values listed in the chart.

(5) *Intermitten troubles.* Intermittent troubles, often difficult to trace, may be made to appear by methodically tapping with an insulated probe in the area of suspected trouble. Faulty

tubes, components, and connections are often discovered by this method.

(6) *Signal substitution.* By introducing a signal normally processed by a unit, the repairman may check a unit rapidly, localizing the trouble to a particular stage.

d. Troubleshooting Procedures. The troubleshooting procedures in this chapter follow the format and the general conditions presented below. Direct and general support personnel will perform these tests, unless final testing only is specified.

(1) *Checking B+ and filament circuits for shorts.*

(*a*) *Purpose.* These tests are resistance checks to determine whether a short circuit exists in the unit.

(*b*) *When to check.* When previous testing indicates a short circuit in the unit, or a unit is received with unknown symptoms, these test should be performed before applying power to the unit.

(*c*) *Conditions for tests.* Disconnect all external cables from the unit and remove it from the console. Set all controls and switches in their normal operating positions.

(*d*) *Test equipment required.* A multimeter is the only test equipment required to perform these tests.

(2) *Bench tests.*

(*a*) *Purpose.* These tests are used to isolate the trouble in a unit to a particular component. They are to be performed by direct support and general support personnel.

(*b*) *When to perform.* Bench tests are required when the operator or organizational tests indicate that a unit is malfunctioning. When no symptoms are known, perform short circuit tests on the bench before proceeding.

(*c*) *Conditions for tests.* Initial testing conditions for the bench tests are described in the bench test setup. Control settings for the unit under test and the test equipment are described in this section.

(*d*) *Test equipment required.* A list of the test equipment required is supplied with the description of the bench test setup.

(3) *Localizing trouble.* A series of test procedures are presented which isolate the malfunction to a single stage of the circuitry. When a test fails, refer to the accompanying troubleshooting chart for further testing.

(4) *Isolating trouble.* When the previous tests have failed to locate the defective component, the additional procedures presented under this heading are to be followed.

4-3. Test Equipment Required

The following charts (*a* through *c* below) list test equipment required for troubleshooting the direction finder set. The chart also includes specially fabricated test fixtures for simplifying testing procedures. For completing some of the test setups, operating units of the system used are listed in *b* below.

a. Test Equipment.

Federal stock No.	*Equipment*	*Common name*	*Reference*
6625-553-0142	Multimeter TS-352B/U	Multimeter	TM 11-6625-366-15
6625-911-6368	Counter, Electronic Digital Readout AN/URM-207	Counter	TM 11-6625-700-10
6625-228-2201	Oscilloscope AN/USM-281A	Oscilloscope	TM 11-6625-1703-15
6625-868-8353	Generator, Signal AN/GRM-50	Rf generator	TM 11-6625-573-15
6625-868-8352	Generator, Signal AN/URM-103	Fm signal generator	TM 11-6625-586-12
6625-783-5965	Generator, Signal AN/URM-127	Audio signal generator	TM 11-6625-683-15
5950-235-2086	Transformer, Power, Variable CN-16/U	Variac	
6625-643-1670	Voltmeter, Electronic ME-30B/U	Ac vtvm	TM 11-6625-320-12
6625-913-9781	Multimeter ME-26B/U	Dc vtvm	TM 11-6625-200-15
6625-376-4939	Test Set, Electron Tube TV-7B/U	Tube tester	TM 11-6625-274-12

b. Direction Finder System Units.

Equipment	*Common name*
Receiver, Radio R-725/URR	Receiver

Section II. DS AND GS TROUBLESHOOTING PROCEDURES

WARNING

High voltages are present in the units of the direction finder set.

4-4. Scope of Troubleshooting Procedures

a. The troubleshooting procedures presented in this section cover all units in the direction finder set. They are designed to locate defective components within a unit. Interunit troubleshooting is accomplished using the procedures described in the operator's manual and chapter 3 of this manual.

b. When a defective component has been located, proceed to section III for instructions on repair or replacement.

4–8. Receiver, Radio R–725/URR

a. Modification Data. The R–725/URR is a modified R–390A/URR receiver. The following modifications have been accomplished:

(1) Replaced if. subchassis to improve performance when receiver is used in conjunction with direction finding equipment (fig. FO–4).

(2) The following wiring modifications have been made to reduce hum (fig. 6–5):

(*a*) Open small enclosure at end of vfo unit and lift pin 3 of V701 from ground.

(*b*) Connect a 0.01-uf capacitor between V701–3 and ground.

(*c*) Connect V701–3 to J709–C. Solder connections and close up vfo.

(*d*) Connect P109–C to P121–E (filament return).

(*e*) Disconnect and dead-end wire (with tape) from P112–8.

(*f*) Connect P112–8 to P121–F (filament supply).

(*g*) Parallel-connect a wire from P111–7 to P121–A (primary supply).

(*h*) Parallel-connect a wire from P111–6 to P121–B (primary supply).

(*i*) Parallel-connect a wire from P11902 to P121–C (B+ supply).

(*j*) Connect a wire from P121–D to chassis ground.

(3) See figure 61 in TM 11–5820–358–35 for results of wiring modification. Filament voltage of the vfo from V701–3 to ground now measures 25 volts dc. Resistance from V701–3 to ground now measures 33 K. These are the only voltage/resistance changes caused by the wiring modification described in (2) above.

b. Checking B+ and Filament Circuits for Shorts. Refer to paragraph 4–*d*(1) for a general description of these tests. The information supplied in TM 11–5820–358–35 covers these tests, except that the resistance at test point J512–2 should be 35K.

c. Bench Test Procedures. Procedures for the receiver are described in TM 11–5820–358–35. Follow normal procedures for testing the receiver as outlined in this section, except for the following:

(1) If. troubleshooting chart below is substituted for troubleshooting chart in TM 11–5820–358–35.

(2) If. subchassis components are identified in figures 4–13, 4–14, and 4–15.

(3) Tube voltage and resistance diagram, if subchassis, in TM 11–5820–358–35 is replaced by the diagram in figure 6–10.

(4) Substitute if. stage gain test (*f* below) for if. test TM 11–5820–358–35.

d. If. Subchassis. The troubleshooting chart below outlines procedures for localizing troubles to a stage in the if. subchassis, and indicates probable cause and recommended solutions. If recom-

mended solution does not solve problem, make voltage and resistance checks in accordance with figure 6–10 and correct deficiency. Figures 4–13, 4–14, and 4–15 show the location of components.

e. If. Stage Gain Test. This test supplements tests in TM 11–5820–358–35, and will indicate trouble in the first six stages of the if. subchassis. If a stage reads outside charted values, replace faulty component before proceeding to the next stage.

(1) The stage gain chart below lists the minimum and maximum voltages required at each of the if. stages of the receiver to produce a voltage of −7 volts dc across the diode load. Use this chart as a standard when troubleshooting to check the gain of each if. stage or group of stages. When the receiver output is low and the tubes are operating satisfactorily (as indicated by a tube tester), localize the defective stage by checking the signal voltage level of each state against the chart while using the signal substitution method of troubleshooting, or by measuring the individual stage gain.

(2) To obtain the stage gain readings, connect a multimeter between terminals 14 (DIODE LEVEL) and 16 (GND) of the terminal strip on the back of the receiver. Terminal 14 must be jumpered to terminal 15. Connect the ground lead of the rf generator to the receiver ground, and connect the generator output lead through a 0.1 μf capacitor to the receiver points indicated in the chart. When checking the 455-kHz if. stages, the injection points can be reached by operating the subchassis outside the receiver, using the extension cables, or by inserting a short length of wire into the tube socket terminal. Check the output from the rf generator required to obtain the diode load reference voltage of −7 volts dc against the figures given in the charts.

Chart 4-9. Troubleshooting—Receiver If. Strip

Item	Trouble	Probable cause	Remedy
1	No signal or weak signal when af signal is applied to pins 1 and 2 of tube socket XV510, anode of positive peak limiter.	Capacitor C259, V510	Check components and replace defective part.
2	Weak signal output when af signal is applied to pin 3 of tube socket.	V510 defective, or R542, R544 open	Check and replace component if defective.
3	Weak signal output when af signal is applied to pin 3 of tube socket XV507, cathode of positive peak limiter.	V510 defective or R542, R544 open	Check and replace component if defective.
4	Weak or no output signal when 455-kc modulated signal is applied at pins 1 and 2 of tube socket XV507.	Defective tube or loose jumper between terminals 14 and 15 or rear terminal strip.	Tighten terminals 14 and 15 jumper connections and replace V507 if defective. If trouble persists, check voltage and resistance of circuit components.
5	Weak output when 455-kHz modulated signal is applied to pin 5 of tube socket XV506, plate of sixth if. amplifier.	T506 open or shorted or not properly aligned.	Check and replace T506 if open or shorted. For alignment, refer to chapter 4.
6	Apply 455-kHz modulated signal to pin 1 of V506, grid of sixth if. amplifier. Output should be louder than in step 5.	Open C523 or C524, or defective tube.	Shunt capacitors with ones of like value and replace if defective. Check V506.
7	If. subchassis still defective	Defective if. stage	Refer to paragraph 3-9e for if. stage gain test and replace defective component.

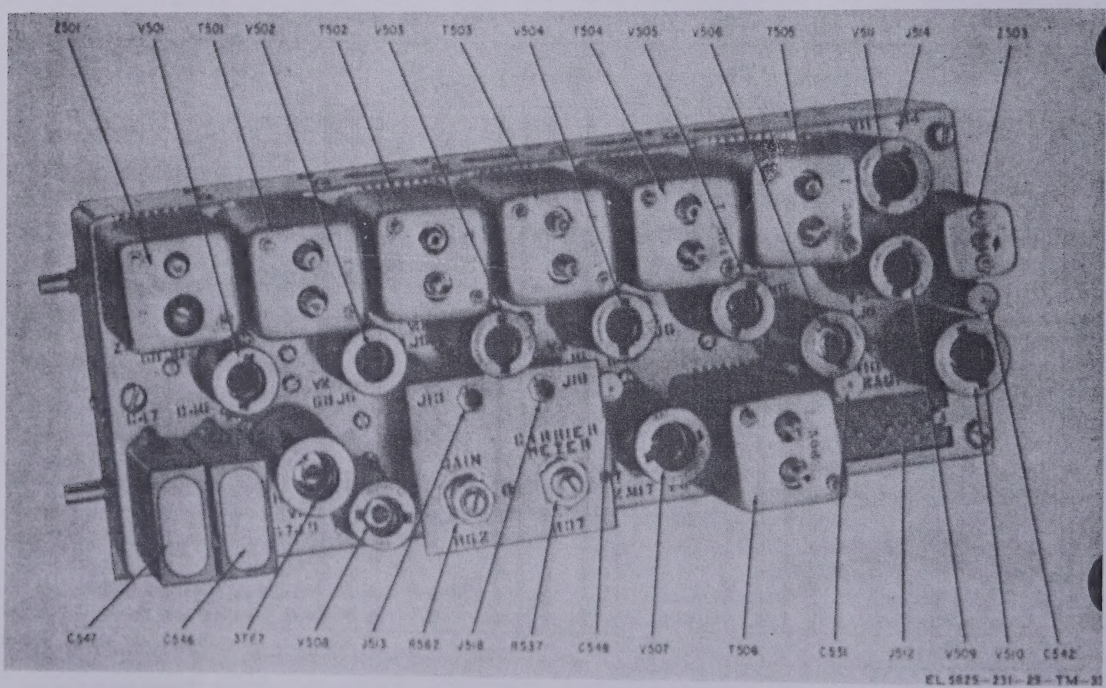


Figure 4-13. If. subchassis, top view, location of components, tubes, transformers & controls.

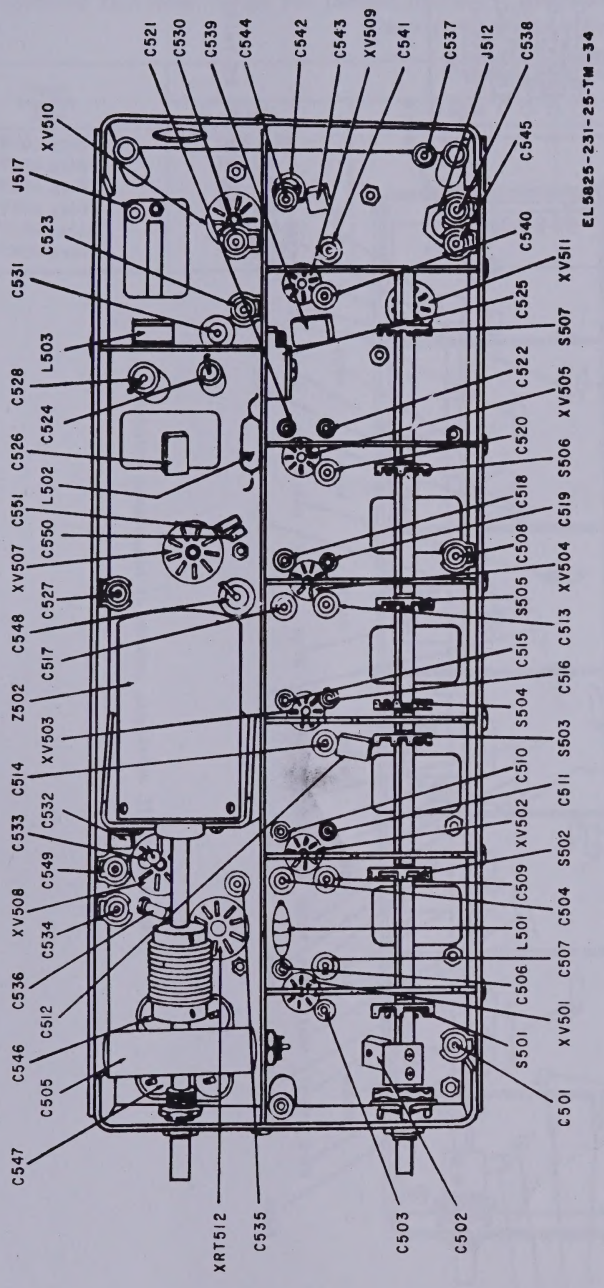


Figure 4-14. If. subchassis, location of components, capacitors.

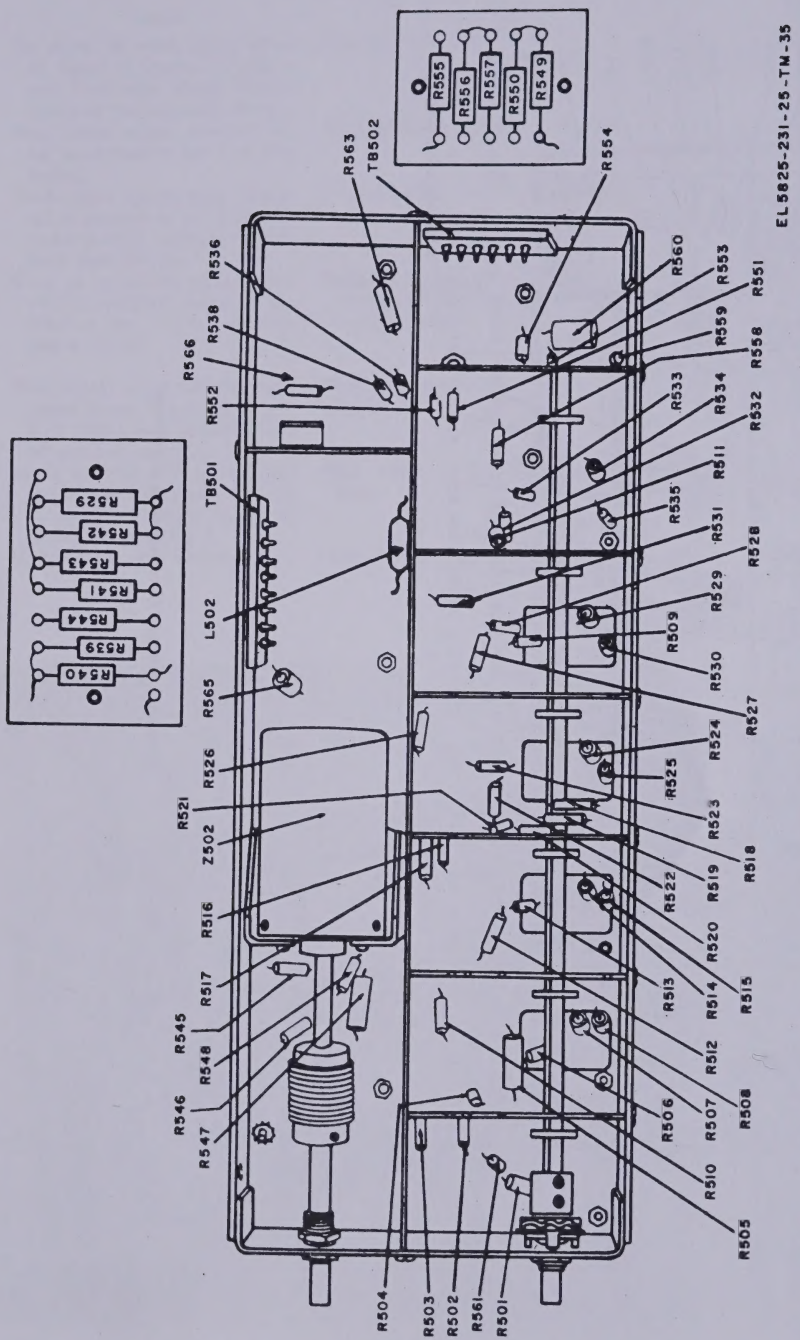


Figure 4-15. If. subchassis, location of components, resistors.

The lowest figure is the minimum and the highest is the maximum that should be required over the specified frequency range for normal operation. However, a reading that is slightly outside this range does not necessarily indicate improper functioning.

Chart 4-10. If. Stage Gain

Signal injection point	Rf generator output (millivolts) bandwidth			
	2 kHz	4 kHz	8 kHz	16 kHz
V501 grid	0.13–0.18	—	—	—
V502 grid	1.5–1.9	1.4–2.0	0.88–1.4	0.86–1.7
V503 grid	2.3–5.0	3.0–5.0	1.1–2.0	0.77–1.3
V504 grid	7.0–12.0	7.0–11.5	6.0–8.7	5.2–7.6
V505 grid	16.0–20.0	16.0–18.0	23.0–28.0	32.0–38.0
V506 grid	420–500	420–500	420–500	420–500

Section IV. ADJUSTMENT AND ALIGNMENT

4-22. General

a. The adjustment and alignment procedures in this section should be performed after repair of a unit and before re-issue for use.

b. When depot maintenance is performed, the repaired unit must pass final testing procedures before release.

c. Refer to the test equipment listed in paragraph 4-3 for test equipment required.

4-26. Receiver Alignment

Alignment instructions for the R-725/URR receiver are available in TM 11-5820-358-35. The following section covers overall gain and bandwidth alignment procedures for the if. subchassis. See figure 4-49 for location of alignment points and figures 4-50 and 4-51 for appropriate test setups called for below.

a. Test Equipment Required.

Federal stock No.	*Equipment*	*References*
6625-553-0142	Multimeter TS-352B/U	TM 11-6625-366-15
6625-913-9781	Multimeter ME-26B/U	TM 11-6625-200-15
6625-868-8353	Generator, Signal AN/GRM-50	TM 11-6625-573-15
5950-235-2086	Transformer, Variable, Power CN-16/U	

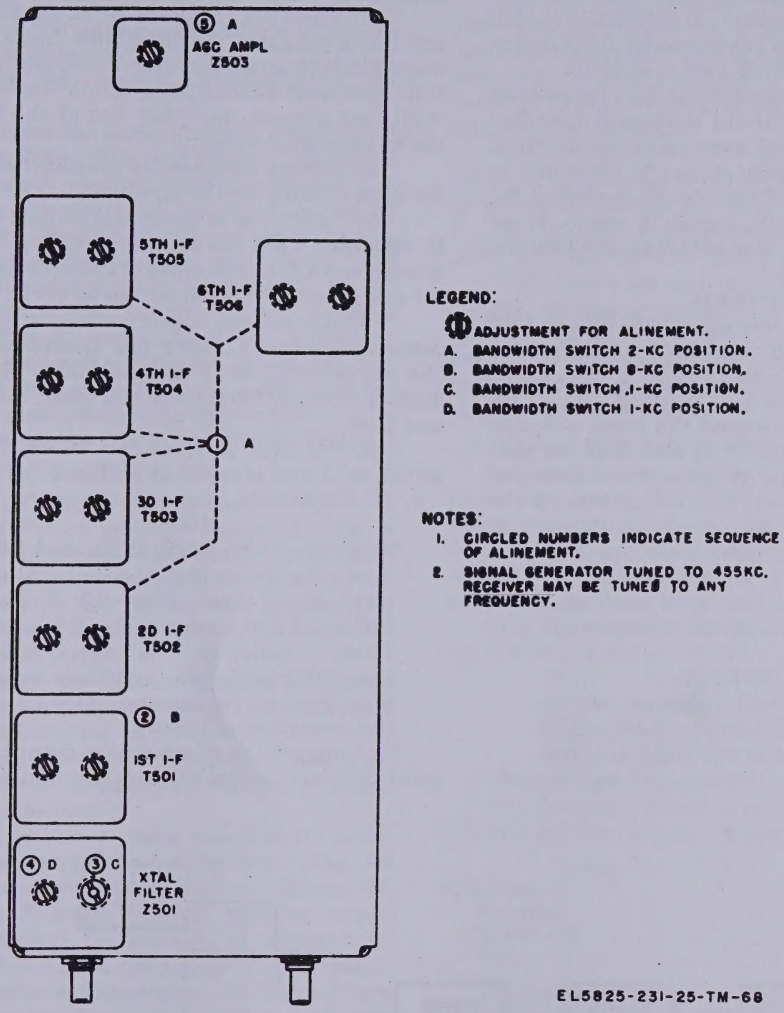


Figure 4–49. If. subchassis, alignment chart.

b. Alignment Test Setup and Control Settings.

(1) Connect Radio Receiver R-725/URR as shown in figure 4–50. Use the variac to maintain the supply at 115 volts ac.

(2) Before performing the alignments, allow the receiver to warm up for 1 hour minimum.

(3) Connect the signal generator to test point E211 (control grid of third mixer tube V204).

(4) For an output meter, connect the

grounded lead of the dc vtvm to the receiver chassis, and connect the other lead to DIODE LOAD terminal 14 of the rear terminal strip. Set the function switch of the dc vtvm for measuring negative dc voltage.

(5) Set the receiver BANDWIDTH KC switch to .1, RF GAIN control to 10, BFO switch to OFF, and FUNCTION switch to MGC.

c. Alignment procedure. Tune the rf generator to 455 kHz (unmodulated); then adjust its frequency control for peak reading on the dc vtvm. To obtain a peak reading, it may be necessary to set the attenuation of the signal generator for high amplitude output signal (3 volts). If no reading on the dc vtvm is obtained, perform the procedure in *d* below.

d. Approximate Alignment.

(1) Tune the rf generator to 455 kHz and set the attenuator for full output. Turn the receiver BANDWIDTH switch to 16 kHz. If the output reading is not yet obtained, proceed with (2) below. If it is obtained, adjust the cores of transformers T506 through T501 and T208 in that order, for peak reading on the dc vtvm. Then, set the receiver BANDWIDTH KC switch at the next lower position, and repeat the adjustment of the transformer cores for peak output. Repeat this procedure for each setting of the BANDWIDTH KC switch until peak output is obtained at .1 position of the switch; then proceed to *e* below.

NOTE

The frequency will decrease as the slugs are screwed further into the coils, and will increase as the slugs are withdrawn.

(2) Perform the procedures outlined below only when the transformer cores have been displaced greatly from their normal positions within the coils. Set the receiver BANDWIDTH KC switch to 2 and proceed as follows:

(*a*) Tune the rf generator to 455 kHz and set the attenuator for maximum output. Remove sixth if. amplifier tube V506, and wrap a thin wire lead around pin 1 (grid). Replace the tube, and connect the other end of the lead to the rf generator output.

(*b*) Adjust the cores of transformer T506 for peak reading on the dc vtvm.

(*c*) Apply the dc generator output to fifth if. amplifier V505 the same way as for V506 (*a* above), and adjust the cores of transformer T505 for maximum indication on the dc vtvm.

(*d*) Repeat the above procedure for each remaining set of if. tubes and transformers in the following order: V504 and T504, V503 and T503, V502 and T502, V501 and T501, and V204 and T208.

(*e*) Set the receiver BANDWIDTH KC switch to .1 and proceed as outlined in *e* below.

e. If. Alignment.

NOTE

Resistors R519, R520, R521, and R561 have the following nominal values: R519—1 K ohm; R520—3.3 K ohm; R521—3.9 K ohm; and R561—2.7 K ohm. These resistors directly affect bandwidth and gain, and their values may have to be changed later in the test procedure (*i* below).

(1) Connect the rf generator output to test point E211 and set the rf generator frequency at

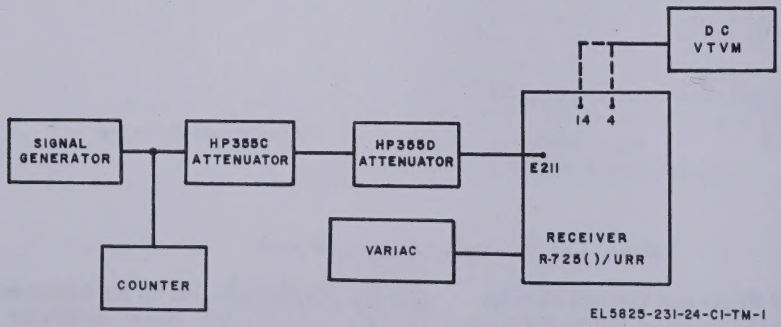


Figure 4-50. Radio Receiver R-725/URR, test setup, alignment.

455 kHz. Carefully tune the rf generator to the exact frequency required to obtain peak output reading on the dc vtvm. While adjusting the rf generator attenuator to maintain an output of approximately 6 volts (as read on the dc vtvm). Do not disturb this frequency setting while performing the instructions in (2), (3), and (4) below. Check the setting repeatedly to make sure it has not changed.

(2) Set the receiver BANDWIDTH KC switch to 2.

(3) Adjust the cores of transformers T506, T505, T504, T503, T502, and T208, in that order, for peak output reading, while continuously adjusting the attenuator of the signal generator to maintain a reading of approximately 6 volts on the dc vtvm. Repeat these adjustments until no further increase in output is noticeable.

(4) Change the setting of the receiver BANDWIDTH KC switch to 8, and adjust the cores of transformer T501 for maximum output. Repeat the adjustment of cores until no further increase in output can be produced.

(5) Return the receiver BANDWIDTH KC switch to .1.

f. Phasing Capacitor Adjustment.

(1) Set the rf generator attenuator for a reading of approximately 6 volts on the dc vtvm and note the attenuator setting. Increase the output 60 db above this setting and decrease the generator frequency until 6 volts is again obtained on the dc vtvm.

(2) Adjust the phasing capacitor in crystal filter Z501 for a minimum dc vtvm reading, and note the position of the capacitor slot.

(3) Tune the signal generator to the high side of the center frequency as required to obtain 6 volts on the dc vtvm.

(4) Adjust the phasing capacitor for minimum reading, and note the position; then set the capacitor approximately halfway between the two settings. To avoid incorrect readings, caused by tuning through the positions of minimum or maximum capacitance, the two settings for minimum or maximum capacitance, the two settings for minimum output must be less than 45° apart.

g. Crystal Filter Adjustment.

(1) With the receiver BANDWIDTH KC switch at .1, tune the rf generator to obtain peak output.

(2) Set the BANDWIDTH KC switch to 1. Adjust the core of the tuning coil in crystal filter Z501 until the frequency reading required for obtaining peak output corresponds exactly with the frequency reading required for peak output with the receiver BANDWIDTH KC switch at .1. Retune the rf generator, and alternately change positions of the BANDWIDTH KC switch as required to complete this adjustment.

h. Agc Adjustment.

(1) Set the receiver BANDWIDTH KC switch to .1, and tune the rf generator for maximum output as described in *e* above. Do not disturb this frequency setting during the adjustment of the agc tuning circuit in the steps in (2), (3), and (4) below.

(2) Disconnect the dc vtvm lead from terminal 14 of the rear terminal strip, and connect it to terminal 4 of the rear terminal strip.

(3) Set the receiver FUNCTION switch to AGC and the BANDWIDTH KC switch to 2.

(4) Adjust the core of Z503 for a maximum voltage reading on the dc vtvm while adjusting the rf generator attenuator to maintain a peak reading of approximately 2 volts. When the adjustment is completed, reconnect the meter to terminal 14 (diode load).

i. Resistor Selection (fig. 4–50).

(1) Switch the receiver BANDWIDTH KC switch to .1, 1, 2, 4, 8, and 16 and observe the output reading on the dc vtvm. If the output changes by more than 10 db, the corresponding resistor must be reselected to maintain the overall gain of the if.

(2) The resistors affecting the corresponding bandwidths are as follows:

R519:	8 kHz
R520:	4 kHz
R521:	0.1 kHz, 1 kHz, 2 kHz
R561:	0.1 kHz

j. Overall Gain Adjustment.

(1) Connect equipment as shown in figure 4–51 and set the controls as follows:

Control	*Setting*
Rf generator:	
Frequency	4.0 MHz
Output level	1.0 to 4.0 uV
Mode	CW
Receiver:	
FUNCTION	MGC
BANDWIDTH KC	8
RF GAIN	Maximum cw

(2) Tune the receiver ANT TRIM control for maximum as read on the dc vtvm. This reading shall be 7 volts minimum.

(3) If the above reading of 7 volts is not obtained, adjust R62.

k. If. Selectivity.

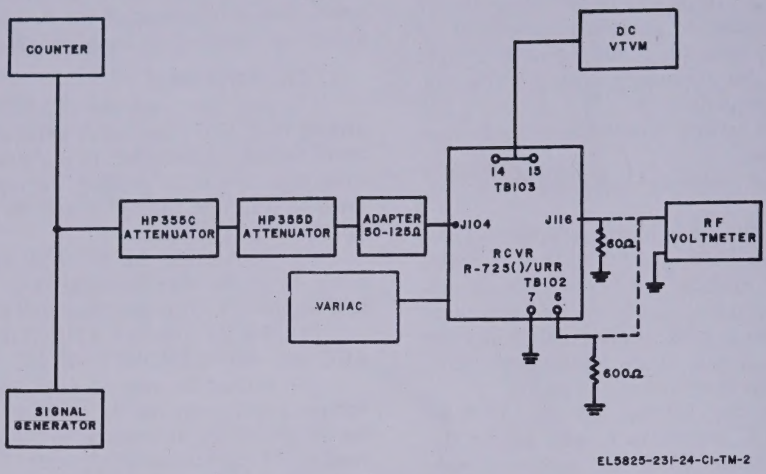


Figure 4–51. Radio Receiver R–725/URR, gain test setup.

(1) Using the test setup in figure 4–51, set controls as follows:

Control	*Setting*
Rf Generator:	
Output level	0.3 V
Frequency	550 kHz
Attenuators	70 db minimum
Receiver:	
FUNCTION	MGC
BANDWIDTH KC	.1 position
RF GAIN	Maximum
Dc vtvm	.1 V position-connected to terminal 14

(2) Tune the receiver for a maximum output as read on the dc vtvm.

(3) With the dc vtvm in the 0.1-volt range (–20 dbm), insert additional attenuation and reduce the receiver RF GAIN control to obtain 0 db on the voltmeter scale. Check the output for overload by observing that 1 db attenuation of input level results in 1 db decrease in output level as indicated by the dc vtvm.

NOTE

If an overload is observed, the receiver RF GAIN must be decreased until the overload condition is removed as determined by (3) above.

(4) Tune rf generator to the low side of center frequency until the output on the dc vtvm decreases by 6.0 db and note this frequency. Repeat this procedure on the high side of center frequency and note the results.

(5) The difference between the two frequencies noted in (4) above shall be between 0.1 kHz and 0.18 kHz. If not, R561 must be reselected.

(6) Remove 60 db of attenuation and tune the generator to the low side of center frequency until the output read on the dc vtvm indicates 0 db. Note this frequency. Repeat this procedure on the high side of center frequency and note the result.

(7) The difference between the two frequencies noted in (6) above shall be a maximum of 5.4 kHz. If not, R561 must be reselected.

(8) Repeat the steps in (4) and (6) above for the 1 position. The limit for the 6-db bandwidth is 0.9 kHz minimum to 1.5 kHz maximum and the 60-db measurement shall be a maximum of 7.2 kHz. If the bandwidths do not meet those specifications, adjust the core of T501.

(9) Repeat the steps in (4) and (6) above for the 2.0 kHz position. The limit for the 6-db bandwidth is 1.7 kHz minimum to 2.5 kHz maximum and the 60-db measurement shall be a maximum of 9.5 kHz. If the bandwidths do not meet these specifications, R521 must be reselected.

(10) Tune the rf generator to 4.4 MHz, and with the receiver BANDWIDTH KC switch at 4, tune the receiver for maximum output, using the dc vtvm as a tuning indicator.

(11) Repeat the steps of (4) and (6) above for the 4.0 kHz position. The limit for the 6-db bandwidth is 3.2 kHz to 4.6 kHz and the 60-db measurement shall be a maximum of 11.0 kHz. If the bandwidths do not meet these specifications, R520 must be reselected.

(12) Repeat the steps of (4) and (6) above for the 8 position. The limit for the 6-db bandwidth is a maximum of 11.5 kHz and the 60-db measurement shall be a maximum of 22.0 kHz.

(13) Repeat the above procedure for the 3-db points with the limit of a minimum of 6.6 kHz frequency difference.

NOTE

If the bandwidths for the 8 position are not within specification, R519 must be reselected or T501 stagger-tuned. In the case of stagger tuning, refer to the procedure in (14) through (20) below.

(14) Refer to figure 4–51, and set the controls as follows:

Rf generator	*Setting*
Frequency	4.4 MHz
Output	0.3 V (0 dbm or higher)
Attenuator	70 db minimum

Receiver	
FUNCTION	MGC
BFO	OFF
BANDWIDTH KC	8
RF GAIN	
Dc vtvm	Connected to terminal 14

(15) Tune the receiver to maximum output as indicated on the dc vtvm, and with the meter in the 0.1-volt range (–20 dbm), insert additional attenuation and reduce RF GAIN control to obtain 0 db reference on the dc vtvm.

(16) Check output for overload as in (3) above.

(17) Tune the rf generator to the low side of center frequency until the dc vtvm reading decrease 3.0 db and note this frequency. Repeat this procedure for the high side of center frequency. The difference between the two frequencies is the 3-db bandwidth.

(18) If the bandwidth is too narrow (the limit is 6.6 kHz minimum), stagger tuning is accomplished by slightly tuning T501 to meet the bandwidth and peak-to-valley requirements.

(19) Turn the receiver BANDWIDTH KC switch to the 16 and check bandwidth as before. The limit for the 3-db points is a minimum of 10.0 kHz; the limits for the 6-db points is a maximum of 17.0 kHz; and the limit for the 60-db points is a maximum of 31.0 kHz.

(20) Check the peak-to-valley ratio by slowly tuning the signal generator through the 6-db bandpass and looking for maximum and minimum indications on the dc vtvm. The peak-to-valley difference will be 4 db maximum.

l. If. Output Characteristics.

(1) Refer to figure 4–51, and set the equipment as follows:

Rf generator	*Setting*
Frequency	1.55 MHz
Function	CW
Output	3 microvolts

Receiver	
BANDWIDTH	8

Receiver	
BFO	OFF
FUNCTION	MGC
RF GAIN	Maximum

Attenuators set for 0 db
Dc vtvm connected to terminal 14

(2) Tune receiver for maximum output as indicated by the dc vtvm, and turn receiver FUNCTION switch to AGC.

(3) There will be a minimum reading of 20 millivolts. If not, readjust R62.

(4) Switch receiver FUNCTION switch to MGC and adjust the rf GAIN control for a 20-millivolt reading on the dc vtvm.

(5) Set the rf generator output to 30 microvolts and observe that the dc vtvm now reads from 170 millivolts to 230 millivolts.

m. Am. Sensitivity.

(1) Connect the equipment as shown in figure 4–51 with the RF voltmeter connected to TB102, pins 6 and 7.

(2) Set the receiver controls as follows:

FUNCTION	MGC
BANDWIDTH	8
BFO	OFF
KILOCYCLE CHANGE	16 MHz

(3) Set rf generator to 16 MHz at an output of 3.3 microvolts, 30 percent 400-Hz modulation.

(4) Adjust the receiver LOCAL GAIN control for a reading of 0 db on the RF voltmeter and then turn the rf generator modulation off and note the db difference as indicated on the meter. This will be a minimum of 10 db.

n. Bfo Operation.

(1) Using the same test setup as in *m* (1) above, turn the rf generator modulation off and turn the receiver BFO switch to ON.

(2) Connect a headset or speaker to J102 (PHONES). The tone frequency should change as the BFO PITCH CONTROL is rotated.

CHAPTER 6

SHIPMENT, LIMITED STORAGE, AND DEMOLITION

6-1. Disassembly and Repacking of Equipment

a. Disassembly. Instruction for disassembly of the AN/TRD-15(*) and AN/TRD-23(*) are given in TM 11-582-231-10. Refer to the manual for the shelter used with the AN/TRD-15(*) for instructions on its disassembly.

b. Repacking. Repackaging of equipment for shipment or limited storage normally will be performed at a packaging facility or by a repackaging team. If emergency packaging is required, select the materials from those listed in SB 38-100. Package the equipment in accordance with the original packaging, as much as possible, with the available materials.

6-2. Demolition to Prevent Enemy Use

Demolition of Direction Finder Sets AN/TRD-23(*) and AN/TRD-15(*) will be accomplished only upon order of the commander. Use the destruction procedures outlined in TM 11-5825-231-10 to prevent further use of the equipment.

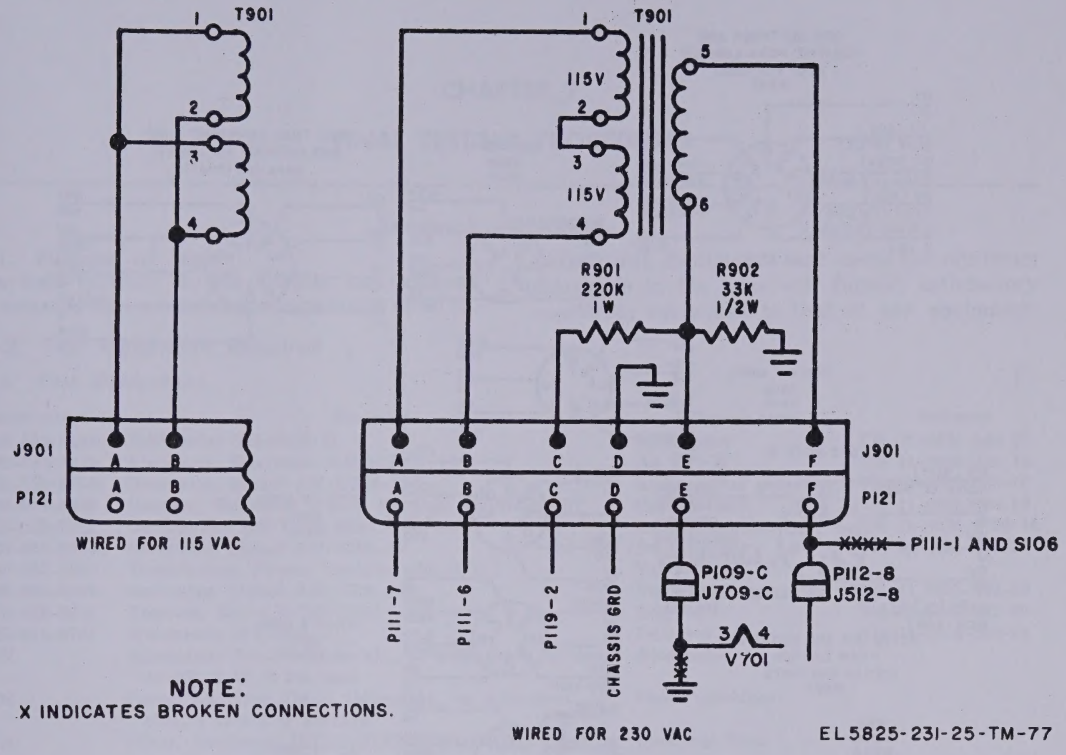
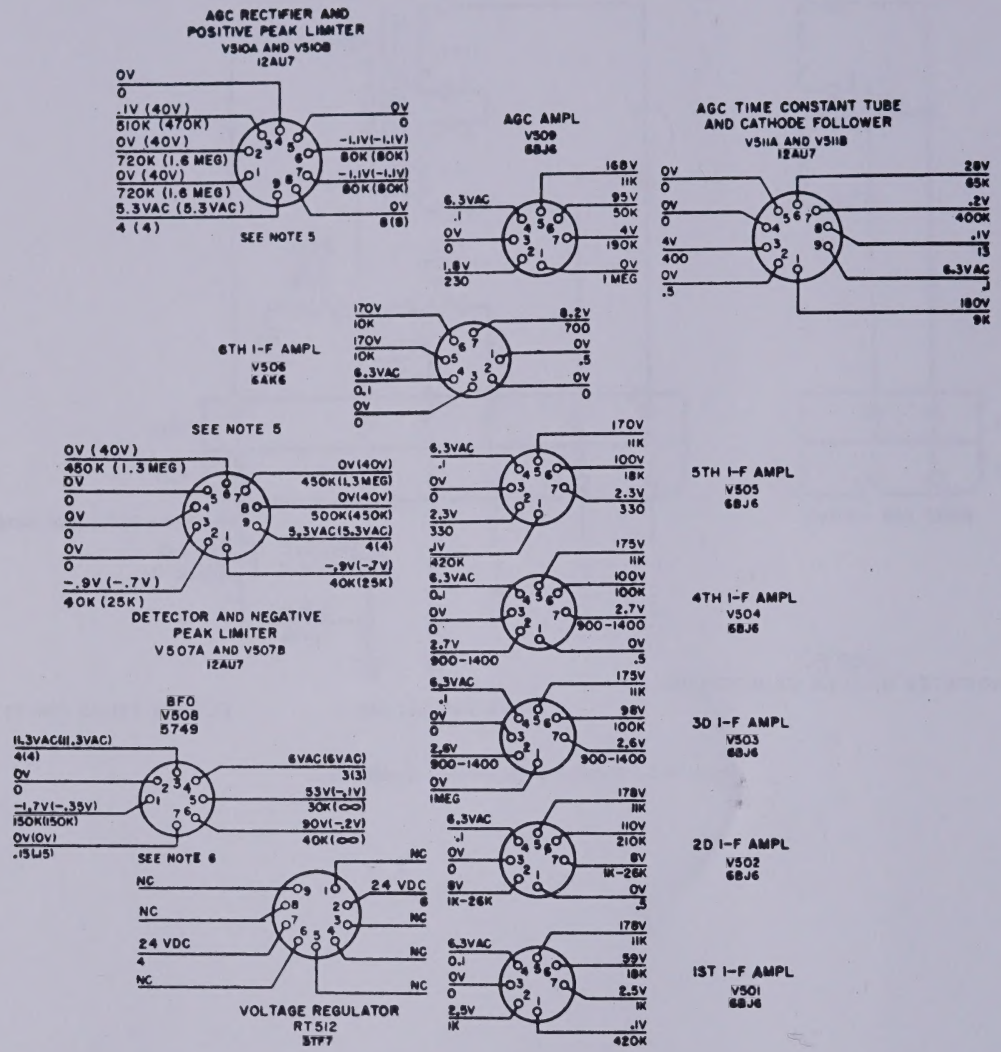


Figure 6-5. R-390A/URR receiver modification.



NOTES:

1. UNLESS OTHERWISE SHOWN,
   RESISTORS ARE IN OHMS AND ARE MEASURED FROM PIN SOCKET TO GROUND WITH A 20,000 OHMS-PER-VOLT METER (SUCH AS MULTIMETER TS-352/U).
   VOLTAGES ARE DC AND ARE MEASURED FROM PIN SOCKET TO GROUND WITH A VTVM (SUCH AS ELECTRONIC MULTIMETER TS-505/U).
   READINGS ARE THE SAME ON ALL BANDS.
2. NC INDICATES NO CONNECTION.
3. ∞ INDICATES INFINITY.
4. UNLESS OTHERWISE NOTED, SET CONTROLS AS FOLLOWS:
   SET S801 TO 115 VOLTS AC, FUNCTION TO AGC, AUDIO RESPONSE TO MED, RF GAIN TO 10, LOCAL GAIN TO 10, AND BANDWIDTH TO 8KC.
5. READINGS IN PARENTHESES ARE MADE WITH LIMITER AT OFF. OTHER READINGS ARE WITH LIMITER AT 10.
6. READINGS IN PARENTHESES ARE MADE WITH BFO AT OFF.

EL5825-231-25-TM-02

Figure 6–10. If. subchassis, vr measurements.

SC 3585 A

CHAPTER 7

FINAL TESTING PROCEDURES

Section I. GENERAL

7-1. Purpose of Tests

The tests outlined in this chapter are designed to measure the performance capability of a repaired unit. Equipment that meets the minimum standards in the tests will furnish satisfactory operation, equivalent to that of new equipment.

7-2. Test Equipment Required

a. Test Equipment.

Federal stock No.	*Equipment*	*Common names*	*References*
6625-553-0142	Multimeter TS-352B/U	Multimeter	TM 11-6625-366-15
6625-643-1670	Voltmeter, Electronic ME-30B/U	Ac VTVM	TM 11-6625-320-12
6625-783-5965	Generator, Signal AN/URM-127	Audio signal generator	TM 11-6625-683-15
6625-911-6368	Counter, Electronic Digital Readout AN/URM-207	Counter	TM 11-6625-700-10
6625-228-2201	Oscilloscope AN/USM-281A	Oscilloscope	TM 11-6625-1703-15
6625-868-8353	Generator, Signal AN/GRM-50	Rf generator	TM 11-6625-573-15
5950-235-2086	Transformer, Power, Variable CN-16/U	Variac	
6625-868-8352	Generator, Signal AN/URM-103	Fm signal generator	TM 11-6625-586-12
5820-069-8915	Receiver, Radio R-725/URR	Receiver	TM 11-5825-231-25
6625-913-9781	Multimeter ME-26B/U	Dc vtvm	TM 11-6625-200-15
NSN	Attenuator PA-10 (Microlab), or equivalent, 72 ohm, 10 dB, 2 W, 2 kw peak	Attenuator	
NSN	Power combiner DA-3 (Microlab), or equivalent, 50 ohm, 3 arm 2 w average	Power combiner	
NSN	Filter, bandpass (BURNELLNYTRONICS) S-54655 (18-32 MHz)	Bandpass filter	
	Voltmeter, Electronic AN/URM-145	Sweep generator	TM 11-6625-524-14
	Radio Interference Measuring Set AN/URM-85	Field strength meter	TM 11-6625-351-12
NSN	Phase angle voltmeter, ADYU Electronics Model 524	Phase angle voltmeter	

b. Direction Finder Set AN/TRD-15(*), AN/TRD-23(*) Units.

c. Test Fixture.

Equipment	*Fig. reference*
Antenna simulator	7-2
Phase shift network	4-17
Power supply	4-26
Azimuth indicator	7-17
Power panel	7-19
Adapter, receiver	7-8

Section II. TEST PROCEDURES

7-6. Receiver, Radio R-725/URR

a. Test Equipment Required. Refer to paragraph 7-2 for common names.

Federal stock No.	*Equipment*	*References*
6625-553-0142	Multimeter TS-352B/U	TM 11-6625-366-15
6625-643-1670	Voltmeter, Electronic ME-30B/U	TM 11-6625-320-12
6625-911-6368	Counter, Electronic Digital Readout AN/URM-207	TM 11-6625-700-10
6625-868-8352	Generator, Signal AN/GRM-50	TM 11-6625-573-14
5950-235-2086	Transformer, Power, Variable CN-16/U	
NSN	Attenuator PA-10 (Microlab), or equivalent, 72 ohms, 10 dB, 2w, 2 kw peak	
NSN	Phase angle voltmeter, ADYU Electronics Model 524	Literature packed with the equipment
Locally fabricated (fig. 7-8)	Adapter, transmission line to receiver input	TM 11-5825-231-24
6625-783-5965	Generator, Signal AN/URM-127	TM 11-6625-683-15
6625-913-9781	Multimeter ME-26B/U	TM 11-6625-200-15

b. Test Setup.

(1) Connect the equipment as shown in figures 7-8 and 7-9.

(2) Set the equipment controls as follows:

Equipment	*Control*	*Setting*
Receiver	FUNCTION	AGC
	BFO	OFF
	BANDWIDTH KC	2
	RF GAIN	10
Signal Generator AN/GRM-50	MODULATION	EXT
	FREQUENCY	10 MHz
	OUTPUT	6 mv
Generator Signal AN/URM-127	FREQUENCY	400 Hz
	OUTPUT	Set for 30% modulation on AN/GRM-50

f. Phase Shift (fig. 7-9).

(1) Turn on the receiver and adjust the variac for 115 volts input.

(2) Tune the receiver to the rf generator frequency (10 MHz), and fine tune for an if. output of exactly 455 kHz on the counter. Record the phase angle as read from the phase angle voltmeter.

(3) Retune the receiver for a reading of 455.750 kHz (+750 Hz) on the counter. Record the phase angle voltmeter reading.

(4) Repeat (3) above for a frequency of 454.250 kHz (−750 Hz).

(5) The maximum phase shift between the three readings shall be ±2°.

d. Agc Characteristic (fig. 7-10).

(1) Connect the equipment as shown in figure 7-10.

(2) Set the rf generator for 5 microvolts output, and adjust the receiver LOCAL GAIN control for 7 db on the ME-30C/U.

(3) Increase the rf generator output to 1, 10, and 100 millivolts, noting the db increase in the output level at each step. Compare results with the limits given below.

Input	*Output*
5 μvolt	0 db (reference)
1 mvolt	+ 5 db maximum
100 mvolt	+ 10 db maximum
1,000 mvolt	+ 20 db maximum

e. Sensitivity (fig. 7-10).

(1) Set the equipment controls as follows:

Equipment	*Control*	*Setting*
Signal generator	FREQUENCY	1.0 MHz
	OUTPUT	10.0 μvolts
Receiver	BANDWIDTH KC	8
	FUNCTION	MGC
	LOCAL GAIN	10

(2) Adjust the receiver KILOCYCLE CHANGE and ANT TRIM controls for a maximum indication on the ac vtvm.

(3) Adjust the receiver LOCAL GAIN control for a db reference on the ac vtvm (approximately 10 db).

(4) Reduce the rf generator level to 3.3 μv. Readjust the LOCAL GAIN control as necessary to maintain the db reference on the ac vtvm.

(5) Set the rf generator MODULATION switch to CW. Read the new db level as measured on the ac vtvm and subtract this reading from the db reference of (3) above.

(6) This difference shall exceed 10 db.

(7) Repeat (2) through (6) above at a frequency of 20.0 MHz and a signal level of 4.4 μv.

f. Overall gain and If. (fig. 7-11).

(1) Connect the equipment as shown in figure 7-11.

(2) Set the equipment controls as follows:

Equipment	*Control*	*Setting*
Signal generator	FREQUENCY	4.0 MHz
	MODULATION	CW
Receiver	BANDWIDTH KC	8

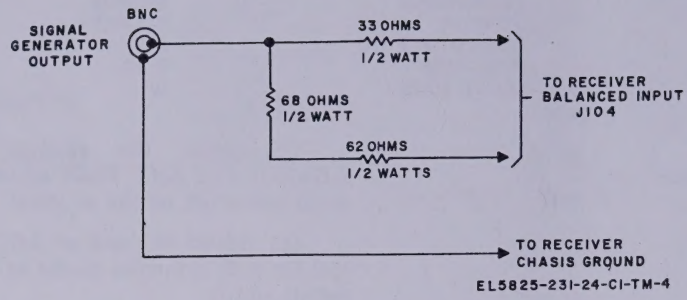


Figure 7-8. Adapter, 50 to 125 ohms.

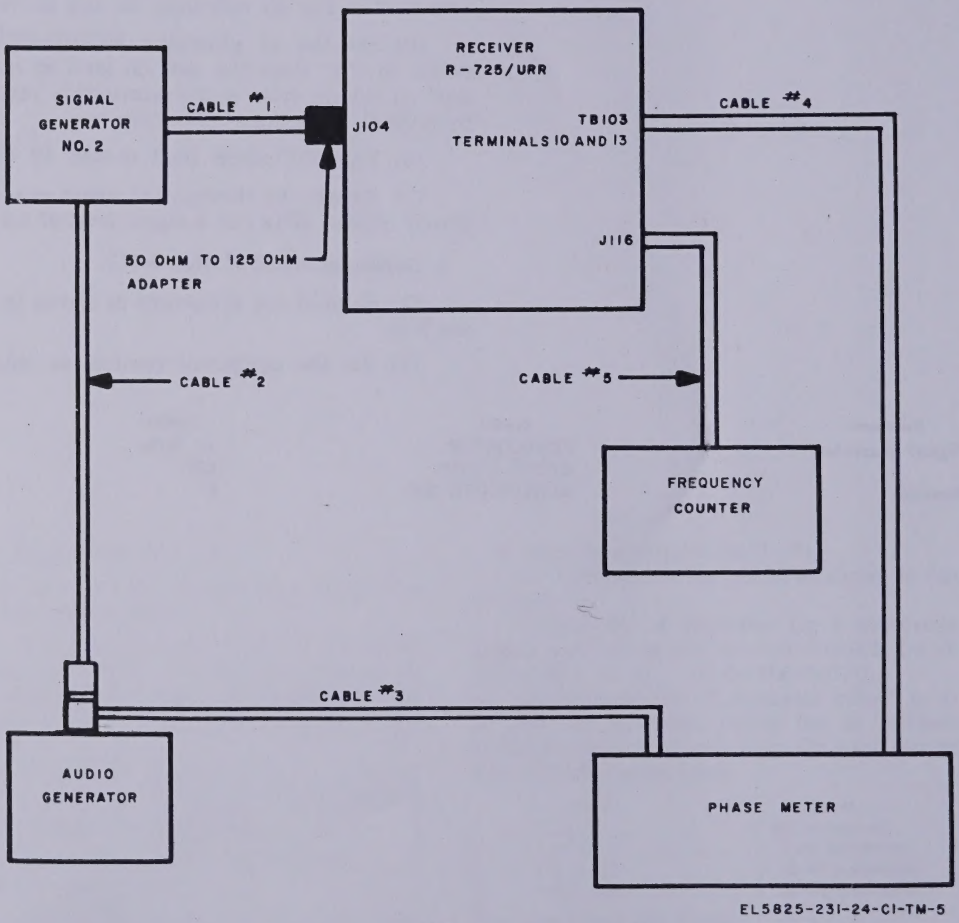


Figure 7-9. Test setup, if. phase shift.

(3) Tune the receiver for maximum output.

(4) Measure the if. on the counter as 455 kHz ±0.3.

(5) Adjust the signal generator output for a reading of 7.0 volts on the dc vtvm.

(6) The signal input should not exceed 4.0 uvolts.

(7) Repeat (1) through (5) above at a frequency of 16 MHz.

g. Selectivity (fig. 7–12).

(1) Connect the equipment as shown in figure 7–12.

(2) Set the equipment controls as follows:

Equipment	*Control*	*Setting*
Signal generator	FREQUENCY	1.0 MHz
	OUTPUT	100 μvolts
	MODULATION	CW
	BANDWIDTH KC	0.1
Receiver	BFO	OFF
	FUNCTION	MGC
	RF GAIN	10

(3) Tune the receiver for maximum output on the ac vtvm.

(4) Retune the rf generator on the low side of the original frequency setting until the reading on the ac vtvm decreases by 6.0 db. Record the new frequency as read on the counter.

(5) Repeat (4) above, tuning the rf generator on the high side of the original frequency.

(6) Repeat (3) through (5) above with the receiver BANDWIDTH KC switch set to 1, 2, 4, 8, and 16.

(7) Tolerances for the high- and low-frequency spread are given below:

BANDWIDTH KC pos	*KILOCYCLE CHANGE readings*
0.1	0.10 to 0.18
1	0.9 to 1.5
2	1.7 to 2.5
4	3.2 to 4.6
8	11.5 max
16	17.0 max

(8) Repeat (3) through (5) at the 3-db points with the BANDWIDTH KC switch set to 8 and 16. The minimum band width is 6.6 kHz for position 8, and 10.0 kHz for position 16.

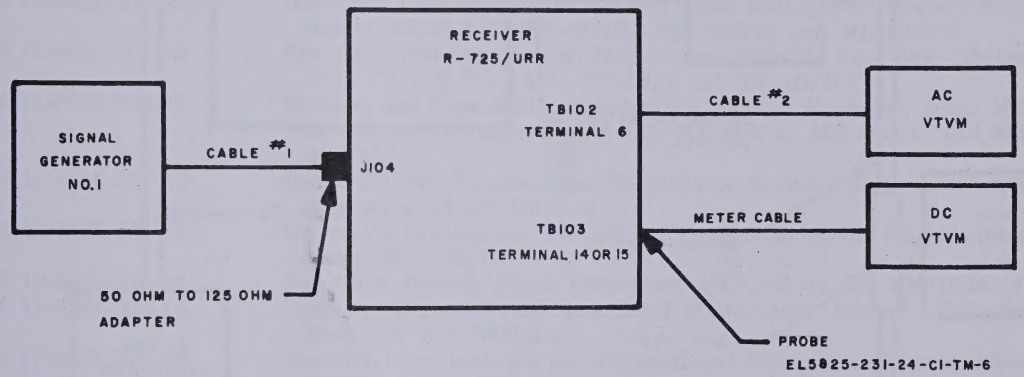


Figure 7–10. Test setup, agc and sensitivity.

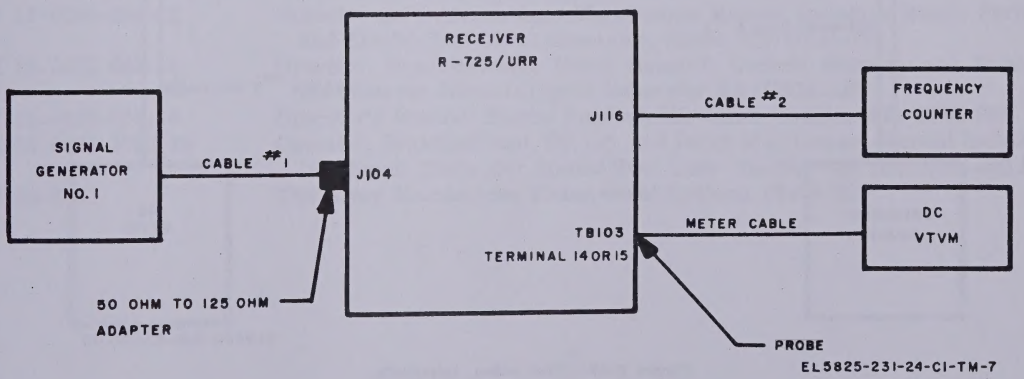


Figure 7–11. Test setup, gain and if.

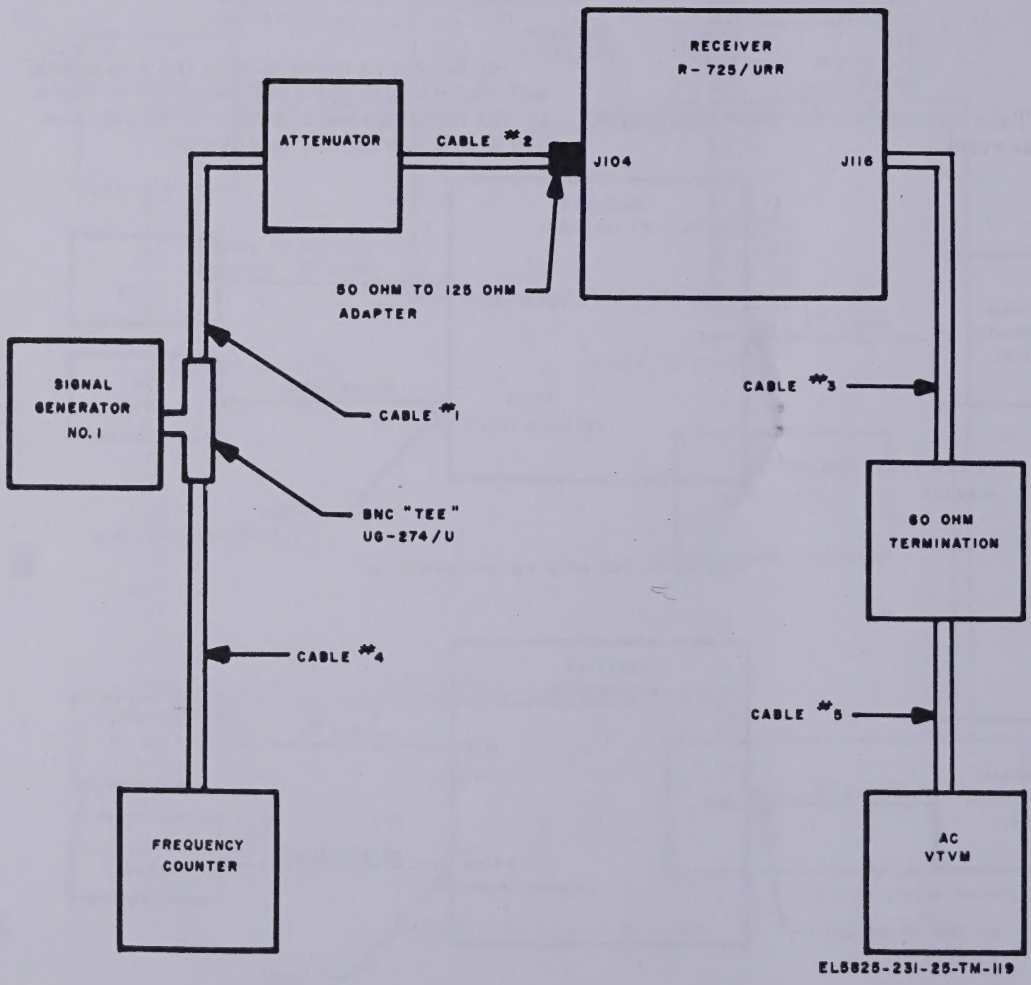


Figure 7-12. Test setup, selectivity.

APPENDIX A

REFERENCES

The following is a list of references applicable to the organizational, and depot maintenance of Direction Finder Sets AN/TRD-23(*) and AN/TRD-15(*).

AR 700-52	Licensing and Control of Sources of Ionizing Radiation
AR 755-380	Disposal of Unwanted Radioactive Material
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders
DA Pam 310-7	Index of Modification Work Orders
TB Sig 225	Identification and Handling of Radioactive Signal Items
SB 38-100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army
TM 11-5820-358-10	Operator's Manual: Radio Receiver R-390A/URR
TM 11-5825-231-10	Operator's Manual: Direction Finder Sets AN/TRD-15, -15A, -23, and -23A
TM 11-5825-231-25	Organization, DS, GS, and Depot Maintenance Manual: Direction Finder Set AN/TRD-15
TM 11-6625-200-15	Operator's Organization, DS, GS, and Depot Maintenance Manual: Multimeters ME-26A/U, ME-26B/U, ME-26C/U, and ME-26D/U
TM 11-6625-274-12	Operator's and Organization Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U and TV-7D/U
TM 11-6625-320-12	Operator and Organization Maintenance Manual: Voltmeter, Meter ME-30A/U and Voltmeters, Electronic ME-30B/U, ME-30C/U, and ME-30E/U
TM 11-6625-351-12	Operator's and Organizational Maintenance Manual: Radio Interference Measuring Set AN/URM-83
TM 11-6625-366-15	Operator's, Organization, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U
TM 11-6625-508-10	Operator's Manual: Signal Generators AN/USM-44 and AN/USM-44A
TM 11-6625-524-14	Operator, Organizational, and Field Maintenance Manual: Voltmeter, Electronic AN/URM-145
TM 11-6625-573-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Signal Generator AN/GRM-50
TM 11-6625-602-12	Organizational Maintenance Manual Including Repair Parts and Special Tool Lists: Test Set, Telephone AN/USM-181
TM 11-6625-586-12	Operator and Organizational Maintenance Manual, Including Repair Parts and Special Tool Lists: Generator, Signal AN/URM-103
TM 11-6625-683-15	Operator, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Signal Generator AN/URM-127
TM 11-6625-700-10	Operator's Manual: Digital Readout, Electronic Counter AN/USM-207
TM 11-6625-1703-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual Including Repair Parts and Special Tool Lists: Oscilloscope AN/USM-281A
TM 38-750	The Army Maintenance Management Systems (TAMMS)

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
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Chief of Staff

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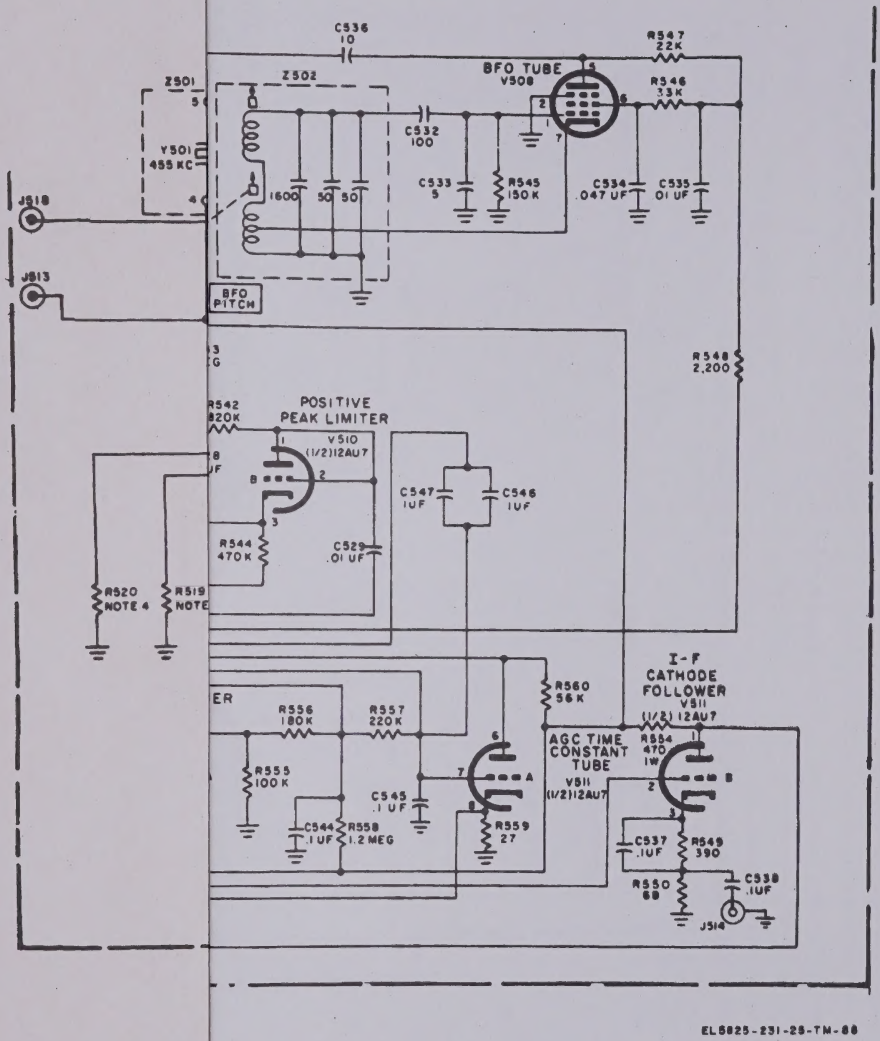
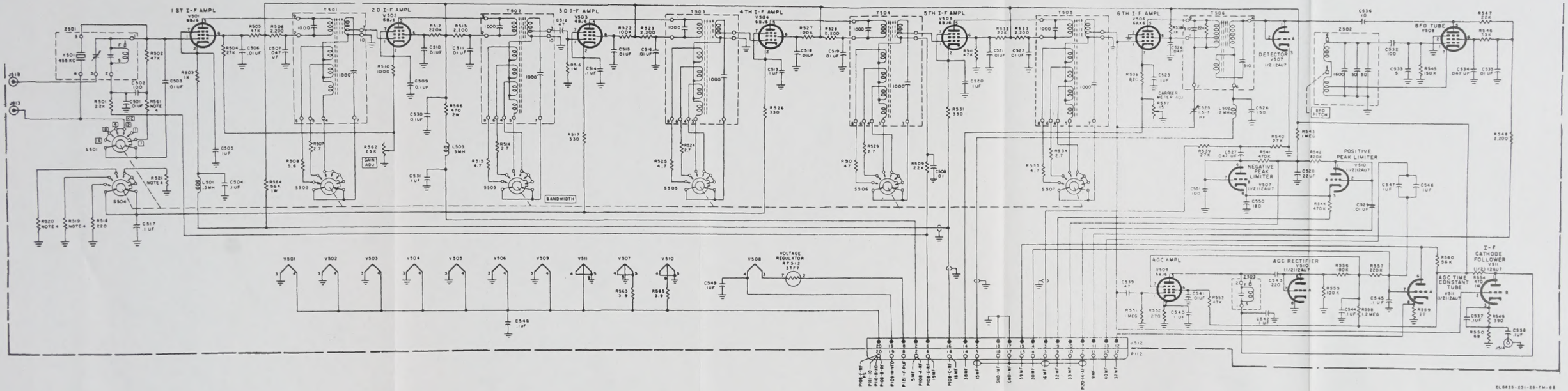
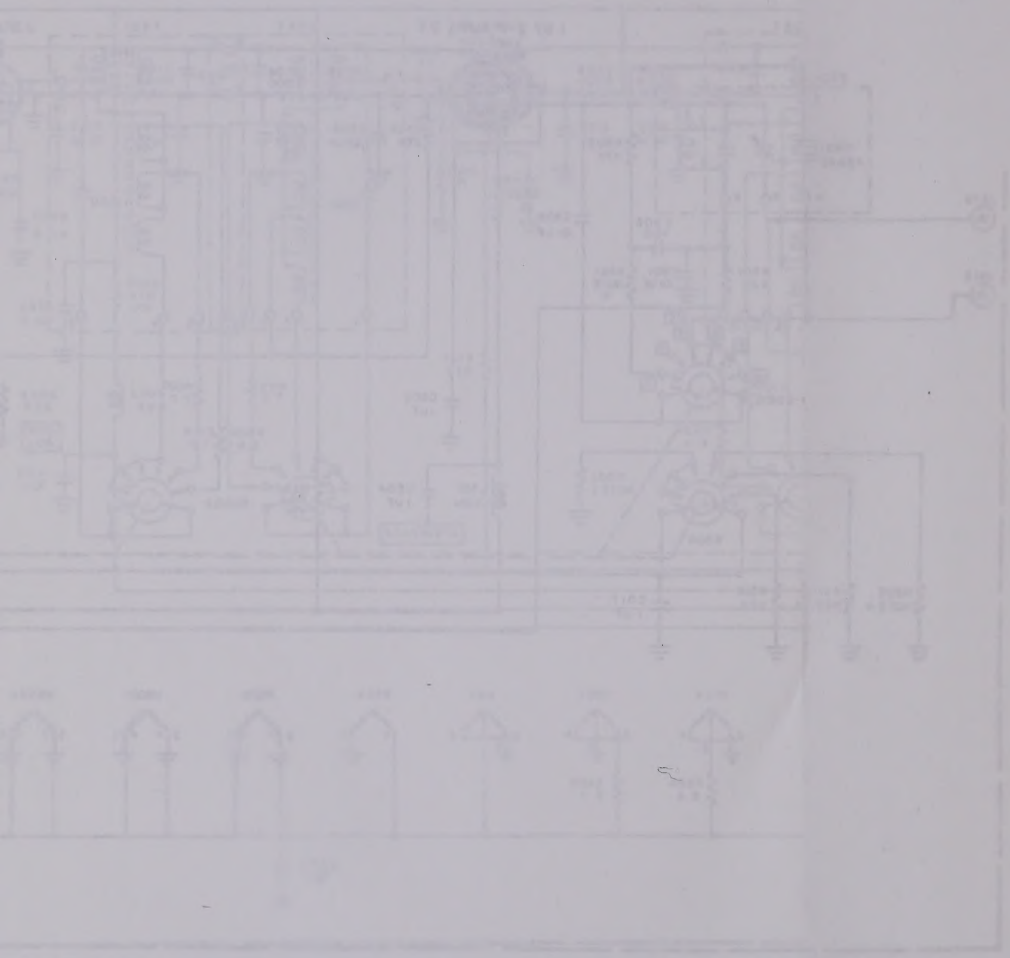
INDEX

	Paragraph	Page
Adjustments:		
General	4-22	4-52
Administrative storage	1-3	1-1
Alignment:		
If. strip	4-26*e*	4-58
Receiver	4-26	4-56
Bench testing	4-2*d*(2)	4-2
Block diagram:		
If. strip (figure 2-11)		2-16
Charts:		
Troubleshooting:		
If. strip (chart 4-9)	4-8*d*	4-16
Gain (chart 4-10)		4-19
Monthly preventive maintenance	3-4	3-1
Quarterly preventive maintenance	3-5	3-2
Checking B+ and filament	4-2*d*(1)	4-2
Demolition	6-2	6-1
Forms and records	1-3	1-1
Functioning:		
Receiver	2-8*a*(2)	2-14
Gain chart	4-8*e*	4-14
If. strip:		
Alignment	4-26*e*	4-58
Block diagram (figure 2-11)	2-8*b*	2-15
Gain chart	4-8*e*	4-14
Schematic diagram (figure FO-4)		
Stage analysis	2-8*c*	2-15
Troubleshooting (chart 4-9)	4-8*d*	4-13
Indexes of publications	1-2	1-1
Limited storage	6-1	6-1
Localization of trouble	4-2*c*	4-1
Lubrication	3-6	3-3
Maintenance, organizational	3-3	3-1
Meter readings:		
V/r measurements	4-2*c*	4-1
Demolition	6-2	6-1
Forms and records	1-3	1-1
Functioning:		
Receiver	2-8*a*(2)	2-14
Gain chart	4-8*e*	4-14
If. strip:		
Alignment	4-26*e*	4-58
Block diagram (figure 2-11)	2-8*b*	2-15
Gain chart	4-8*e*	4-14
Schematic diagram (figure FO-4)		
Stage analysis	2-8*c*	2-15
Troubleshooting (chart 4-9)	4-8*d*	4-13
Indexes of publications	1-2	1-1
Limited storage	6-1	6-1
Localization of trouble	4-2*c*	4-1
Lubrication	3-6	3-3
Maintenance, organizational	3-3	3-1
Meter readings:		
V/r measurements	4-2*c*	4-1
Monthly preventive maintenance chart	3-4	3-1
Organizational maintenance:		
Preventive maintenance	3-3	3-1
Scope	3-1	3-1
Tools and test equipment	3-2	3-1
Receiver:		
Alignment	4-26	4-56
Description	2-2*d*	2-4
Functioning	2-8*a*(2)	2-14
If. strip (figure 6-5)	4-8*a*	4-12
Troubleshooting	4-8	4-12
Preventive maintenance:		
General	3-3	3-1
Monthly chart	3-4	3-1
Quarterly chart	3-5	3-2
Quarterly preventive maintenance chart	3-5	3-2
Schematic diagrams:		
If. strip (figure FO-4)		
Sectionalization	4-2*b*	4-1
Shipment	6-1	6-1
Stage analysis:		
If. strip	2-8*c*	2-15
Storage	6-1	6-1
Test equipment required:		
DS, GS, and final testing	4-3	4-2
Organizational maintenance	3-2	3-1
Troubleshooting:		
If. strip	4-8*d*	4-13
Receiver	4-8	4-12
Troubleshooting chart:		
If. strip	4-8*d*	4-13
Troubleshooting procedures:		
DS, GS, and final testing	4-2*d*	4-2
Organizational	3-7	3-3
Visual inspection	3-8	3-3
V/r measurements	4-2*c*	4-2
Visual inspection	3-8	3-3



FO-4. If. subchassis, schematic diagram.



FO-4. *If. subchassis, schematic diagram.*